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The World Bank

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Report No. 14752

PROJECT COMPLETION REPORT

KOREA

THIRD TECHNOLOGY ADVANCEMENT PROJECT
(LOAN 3315-KO)

JUNE 30, 1995

Human Resources Operations Division
Country Department I
East Asia and Pacific Regional Office

CURRENCY EQUIVALENTS

Currency Unit - Korean Won (W)

US$1.00 = W710

(February, 1991)

GLOSSARY

GPN	-	General Procurement Notice
IFB	-	Invitation for Bid
KBSC	-	Korea Basic Science Center
KIST	-	Korea Institute of Science and Technology
KOSEF	-	Korea Science and Engineering Foundation
KRISS	-	Korea Research Institute of Science and Standards
MOF	-	Ministry of Finance
MOST	-	Ministry of Science and Technology
MTI	-	Ministry of Trade and Industry
NITI	-	National Industrial Technology Institute
OSROK	-	Office of Supply, Republic of Korea
O&M	-	Operations and Maintenance
PCR	-	Project Completion Report
PITC	-	Provincial Industrial Testing Center
R&D	-	Research and Development
SAR	-	Staff Appraisal Report
SMI	-	Small and Medium Industry
TA	-	Technical Assistance
TAP	-	Technology Advancement Project

FISCAL YEAR

January 1 - December 31

ACADEMIC YEAR

March - February

THE WORLD BANK
Washington, D.C. 20433
U.S.A.

Office of Director-General
Operations Evaluation

June 30, 1995

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

SUBJECT: **Project Completion Report on Korea - Third Technology Advancement Project (Loan 3315-KO)**

Attached is the Project Completion Report (PCR) on the Korea - Third Technology Advancement project (Loan 3315-KO, approved in FY91), prepared by the East Asia and Pacific Regional Office. Part II was prepared by all three beneficiary institutes.

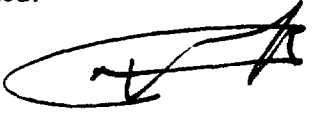
This is the third and the last in a series of projects which aimed at providing funds for the purchase of modern equipment needed by five prestigious national institutes for their research and development (R & D) efforts. The broad objective of this project was to strengthen industrial R & D and basic research capacity and to enhance the application of industrial standards to raise the quality of products. This was in conformity with the Government's policy which sought to expand and strengthen vocational, technical and tertiary education in science and engineering, as well as public and private R & D activities to support Korea's quest to join the ranks of the industrialized countries.

The availability of the new equipment and facilities made it possible for the three institutes to increase their R & D activities, joint projects, testing for quality improvement and technical and scientific publications. The Korea Institute of Science and Technology (KIST), for example, has increased its contribution to national and international academic and engineering publications from 254 in 1991 to 367 in 1993, while the aggregate number of commercialized R & D results have reached 51 between 1991 and September 1994. At the National Industrial Technology Institute (NITI), the number of technical assistance projects to the small-and medium-scale enterprises has grown from 803 in 1991 to 1309 in 1994, while the number of test certificates issued increased to an annual level of 140,000 in 1994 from 51,000 in 1991.

Through its lending to the education sector and for technology development, the Bank has been closely associated with the technological advancement of Korea. This association has made it possible for the Bank to gain valuable insight and experience in the design of technology development projects and their successful implementation.

Considering the success of the institutes in improving their laboratories, carrying out more R & D projects and achieving results, the outcome of this project is rated as satisfactory. The project has had substantial institutional development impact and its sustainability is rated as likely.

The PCR is of satisfactory quality. No audit is planned.



Attachment

PROJECT COMPLETION REPORT

KOREA

THIRD TECHNOLOGY ADVANCEMENT PROJECT
(Loan 3315-KO)

Table of Contents

[1] The designation of the National Industrial Research Institute was changed to the National Industrial Technology Institute in 1992.

PROJECT COMPLETION REPORT

KOREA

THIRD TECHNOLOGY ADVANCEMENT PROJECT

(LOAN 3315 - KO)

PREFACE

This is the Project Completion Report (PCR) for the Third Technology Advancement Project in Korea for which Loan 3315-KO in the amount of US$60.0 million was approved on April 2, 1991. The loan was closed on schedule on June 30, 1994. The loan account books were kept open to honor applications received before October 31, 1994. The last transaction was made on September 22, 1994. The loan account was closed on September 22, 1994 with a total disbursement of US$59.8 million or 99.7% of the loan account.

The PCR was prepared in November/December, 1994 by EA1HR (Preface, Evaluation Summary, Parts I and III). The Borrower's Ministry of Finance was requested to act as the coordinator for the three parts of Part II of the PCR. The three reports constituting Part II were received in the Bank in November 1994.

Preparation of this PCR was started in November 1993 when a Bank mission requested the three institutions concerned to complete and return Project Review from Borrower's Viewpoint (Part II) and Bank-prepared pro-formas for the preparation of Part III of the PCR. The May 1994 Bank mission followed up with reminders on the pro-formas and the obligations of the borrower for submission of Part II of the PCR to the Bank. Based, inter alia, on the Staff Appraisal Report, the Loan Agreement dated June 30, 1991, supervision and progress reports, correspondence between the Bank and Borrower, and internal Bank memoranda and documents, Bank staff prepared the PCR in November/December, 1994.

PROJECT COMPLETION REPORT

KOREA

THIRD TECHNOLOGY ADVANCEMENT PROJECT
(LOAN 3315 - KO)

EVALUATION SUMMARY

OBJECTIVES

(i) The objectives of the project were largely met (paras. 6 and 15). The objectives of the project were to improve the quality of research programs for developing advanced technologies, increasing opportunities for joint basic research activities through strengthening common research facilities, and to enhance the development and application of industrial standards. The impact of the project in all three project institutions was positive (paras. 15 and 16).

IMPLEMENTATION EXPERIENCE

(ii) Overall implementation experience was generally satisfactory. The project closed on schedule with no cost overrun. There were three components - equipment and technical assistance financed by the loan, and equipment-related civil works, which were financed by the Government. Equipment procurement was very close to target with disbursements of US$58.5 million out of loan proceeds of US$60.0 million. Thus actual disbursements were 99.7% of the loan amount. There was one violation of the Bank's Procurement Guidelines(May 1985) on the part of the National Industrial Technology Institute (NITI) which neglected the announcement of the General Procurement Notice. This was resolved and did not adversely affect the bidding process for equipment. Cooperation between the Bank and the project institutions was generally satisfactory, which can be attributed to strong start-up assistance from the Bank, good project preparation, and the high quality of local implementation officials.

RESULTS

(iii) The equipment procured under the project was relevant to the project's objectives. The quality of research programs has been improved at KIST. The opportunity for joint research activities in the basic sciences has been increased through the strengthening of joint common facilities at KBSC. The development and application of industrial standards through the strengthening of NITI has been enhanced.

SUSTAINABILITY

(iv) The government's continued strong emphasis on science and technology aimed at entering the ranks of technologically advanced countries assures the sustainability of this project. The project institutions are prestige institutions in Korea and receive strong support from their parent ministries and the government (paras. 17-19). KIST is one of Korea's leading multi-disciplinary research institutes covering a broad spectrum of applied research activities. Thus it will continue to be well-financed and to recruit high quality researchers, thereby ensuring the sustainability of the project's investment. KBSC, which was established to provide more opportunities for joint basic science research, is given priority according to the government policy to promote basic science, the very foundation of technological innovation. NITI is supporting small and medium industry (SMI) by carrying out mandatory tests and analyses related to industrial standards, product quality control, weights and measures etc., thereby raising product quality. The government's determination to reduce dependence on imported technology and industrial parts is reflected in policies to encourage SMIs to raise product quality. The importance of this institute will ensure continued strong support from government which, in turn, will reinforce the sustainability of the project's investments.

FINDINGS AND LESSONS LEARNED

(v) Project design was consistent with sectoral objectives and with previous Bank lending in technology development and science and technical education in Korea. Project design focused on hardware (equipment and civil works) which was appropriate in view of the well-developed state of the project institutions. They were well-managed, staffed and financed. The need was for upgrading the teaching and research laboratories to permit the highly-qualified staff to work more effectively. Given the straightforward nature of project design and its successful implementation, there were no major lessons to be learned. Nevertheless, some insight can be gained. Strong initial start-up assistance from the Bank and the dedication of competent local staff enhanced the prospects for successful implementation.

PROJECT COMPLETION REPORT

KOREA

THIRD TECHNOLOGY ADVANCEMENT PROJECT
(Loan 3315-KO)

PART I. PROJECT REVIEW FROM BANK'S PERSPECTIVE

A. Project Identity

- Project Name: Third Technology Advancement Project
- Loan No.: 3315-KO
- RVP Unit: East Asia and Pacific Region, Country Department I
- Country: Korea
- Sector: Education
- Subsector: Science and Technology

B. Project Background

1. Sector Development Objectives In support of the Government's industrial restructuring policy, the objectives of the science and technology sector were to:

- develop and utilize technology to the fullest;
- gain continued improvements in productivity;
- expand high value added output which is technologically sophisticated, energy efficient and strongly export-oriented; and
- enhance the role of small and medium industry (SMI) for reducing industrial concentration and over-dependence on imported parts and materials.

In line with these priorities, the education sector's objectives were: to develop R&D capacity in both educational institutions and research institutes; to develop indigenous technology to overcome the increasing difficulty of importing technology from abroad; and to upgrade and restructure the skill mix requirements for meeting the demands of an increasingly technology-intensive industrial sector.

2. Policy Context. The government places heavy emphasis on the promotion of science and technology with the primary policy directions on developing selected high-technology areas towards the 21st century, strengthening science programs for the younger generation, and securing stable financial resources for R&D investment. The above objectives are reflected in the Government's strong commitment to the promotion of science and technology.

3. Research and Development. The growth of R&D in Korea underwent three major changes. First, the emphasis in the early stage on Government expenditures changed to the predominantly industry-funded investments following the introduction, in the 1970s, of incentives for the private sector to expand R&D expenditures. Second, total R&D expenditures increased from 0.6% of GNP in 1980 to 2% in 1986 and are planned to reach 3% by 1995 and 5%

by 2001. Third, the ratio of scientists and engineers (the basic human resource for R&D), was planned to increase from 13 per 10,000 population in 1986 to 30 per 10,000 by 2001. Further, the National Project scheme has been introduced to develop broader technological infrastructure in priority areas, strengthen linkage between industry and public R&D institutes and promote research on industry-initiated topics under joint ventures between SMI and contracted research institutes.

4. Science and Technology Education. In Korea, the development of education at the secondary and higher levels has generally borne a close relationship to the country's economic development, especially in relation to industrial growth and restructuring. The shift from labor-intensive to capital-intensive and increasingly to technology-intensive industry has been accompanied by changes in the education system. Early emphasis was placed on vocational and technical education to produce skilled workers. This was followed by an expansion of junior technical colleges to train industrial technicians. As the economy moved towards more technology-intensive production, greater emphasis was placed on undergraduate science and engineering programs to produce professional scientists and engineers followed by priority for graduate education in these fields to supply key R&D personnel.

5. Small and Medium Industry. Industrial policy in the 1970s gave priority to the development of the large conglomerates. They grew rapidly while SMI activity declined in terms of share of employment and value added. In the eighties, this trend was reversed and priority was given to SMI expansion. This reversal was in response to the need to become more self-sufficient in the manufacture of parts and materials for large enterprises thereby reducing the import gap, to encourage regional development and to restructure SMI towards more technology-intensive production with strong emphasis on increasing export capacity.

C. Project Objectives and Description

6. The broad aim of the project was to strengthen industrial R&D and basic research capacity and enhance the application of industrial standards to raise the quality of products. More specifically, the project intended to improve the quality of research programs in the Korea Institute of Science and Technology (KIST) by assisting industry in developing advanced technologies, increasing opportunities for joint research activities in the basic sciences through strengthening Korea Basic Science Center (KBSC), and encouraging the development and application of industrial standards through strengthening the National Industrial Technology Institute (NITI).

7. The project financed equipment, transportation and installation of equipment, consumable material and O&M expenditures related to the equipment for KIST, KBSC and NITI. The equipment lists were reviewed rigorously in each institution. More specifically, these equipment lists included items for common use of all research departments and specialized equipment with a focus on material science and applied science at KIST, expensive research equipment for basic science in KBSC whose frequency of use could not justify its purchase by many institutions, and equipment related to tests and analyses of

weights and measures, industrial standards, industrial product control, safety and energy consumption at NITI. Technical assistance for short-term overseas training and book purchases were also financed for KIST as per an amendment of the loan agreement (paras. 8 and 9), and civil works for KBSC and NITI to house some of the equipment were financed by government.

D. Project Design and Organization

8. At the time of approval, the Bank had financed two technology advancement projects under the same title. This project was the third and last in a series of projects to develop industrial technology in Korea. The Bank had also assisted technical and science education through seven loans which complemented industrial development through the training of technical and scientific manpower. Based upon the previous experience of the Bank, the conceptual framework for the project was appropriate, and it was clearly stated in the SAR. The project was prepared over a four month period, with inputs from the Government's central planning authorities, participating ministries/institutions and Bank staff/consultants. Following the Bank's approval of the project, there was only one relatively minor change in project design. KIST requested the use of unallocated loan funds to finance technical assistance for overseas training and book purchase. The Bank approved this and amended the Loan Agreement in March 1992.

9. The scope and scale of the project were appropriate since it continued to offer support in those areas in which the Bank had previous experience, while addressing the needs of three national institutions which the Government had identified as requiring additional quality-improving investments. The strengthening of these institutions (KIST, KBSC and NITI) assisted industry in developing advanced technology, improving opportunities for joint research activities and raising the quality of industrial products. The project design's focus on hardware (equipment and civil works) was also appropriate. The later addition of a small amount of technical assistance for KIST served to improve the quality of research staff through overseas training while book purchases contributed to raising the effectiveness of researchers. The project institutions were found to be well-staffed by highly-qualified researchers, efficiently managed and well-financed as mentioned in SAR. Their objectives were clearly stated and these were closely related to Korea's science and technology development priorities. The main weaknesses were in the physical aspects of laboratory provision and these were addressed under the project. Upgraded laboratories were viewed as essential to increasing the effectiveness of teaching and research staff.

10. The design of project management centered on the three institutions, each of which was responsible for the implementation of its part of the project, with two institutions (KIST, KBSC) under the general budgetary oversight of the Ministry of Science and Technology (MOST) and NITI under the Ministry of Trade and Industry (MTI) respectively. Based on lessons learned

from Ln. 2427-KO[2], the Bank requested that the Ministry of Finance (MOF) coordinate the preparation of Part II of the PCR. This was carried out successfully and all three project institutions submitted their respective Part IIs on schedule.

E. Project Implementation

11. Comparison of "Planned" versus "Actually Performed" in Project Implementation. There were three components in the project. The first was civil works which was financed by the Government; the second was equipment which was financed by loan proceeds; the third, technical assistance (only for KIST) also financed by the loan. Equipment is dealt with first. For KIST, procurement of about 158 items of equipment was planned with an estimated cost of $13.5 million. The "Actually Performed" figure was 210 items and the contract cost was $13.8 million.[3] For KBSC, 78 items were planned whose estimated cost was $14.7 million, slightly less than the loan allocation of $15.0 million. Procurement of 69 items at a cost of $14.9 million was achieved. NITI procured 402 items of equipment at a cost of $29.8 million, which was also slightly less than NITI's loan allocation of $30.0 million. Therefore, in general, there was little difference between "Planned" and "Actually Performed", especially for the cost of items procured. In aggregate there was no cost overrun. Out of the loan amount of $58.8 million for equipment purchase, $58.6 million was spent on equipment. There was also no time overrun on equipment procurement, as evidenced by the on-schedule loan closing.

12. For civil works, the physical facilities required to house the equipment to be procured under the project already existed at KIST. On the basis of available data, it was not possible to compare "Planned" with "Actual" achievements for the civil works component for KBSC and NITI. However, supervision missions found that construction of KBSC's new campus at Daeduk Science Town and some extensions for NITI were completed in time for the installation of equipment. Regarding Technical Assistance/Book Purchase for KIST, the difference between "Planned" and "Actual" performance was also marginal with planned cost $1.5 million and actual cost $1.2 million. As a whole Project, the amount of loan cancellation was $213,448.13 or about 0.4% of the total loan amount of $60.0 million, and this can be regarded as negligible.

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[2]In para. 8 of Part I of the PCR for Ln. 2427-KO dated May 17, 1991, it was stated that there was a need for a coordinator to oversee the preparation of the PCRs for projects dealing with more than one institution.

[3] The original allocation to equipment for KIST was US$15 million. The amendment to the Loan Agreement (May 1993) reallocated US$1.5 million from the equipment category to technical assistance and books and, therefore, reduced the allocation for equipment to US$13.5 million. Disbursements for technical assistance and books were US$1.2 million. The remaining US$0.3 million was reallocated back to equipment. Thus, total equipment procured was valued at US$13.8 million.

13. Project Risks. There were no major risks foreseen during appraisal. No major problem occurred during implementation. One minor problem occurred at the initial stage of implementation. NITI neglected the announcement of General Procurement Notice (GPN) before inviting bids, thus breaching section 2.8 of the Bank's Procurement Guidelines, May 1985. The Office of Supply, Republic of Korea (OSROK) announced five invitation for bids (IFB) totalling $7.7 million without checking whether the GPN had been adequately announced. According to the Loan Agreement dated at June 3, 1991, this might have been labeled a misprocurement. However, this was resolved by activating the flexibility part in Article 3.02 of the Loan Agreement as an exceptional case based on the observation that the number of responses to IFB was satisfactory. The disbursements were completed during the four month grace period. There was also no problem regarding compliance with covenants (Table 9), submission of audit reports including separate opinion on statement of expenditures (Table 9) and timely submission of progress reports (Annex 2).

14. There were no unforeseen factors which affected project implementation, and there were no actions or decisions taken which affected implementation negatively. There was one change of jurisdiction, with KBSC being transferred to KRISS from KOSEF in October 1991, and later becoming an autonomous body in 1993. This did not produce any adverse effect on project implementation.

F. Major Results of the Project

15. Project Objectives. The objectives of the project were met.

- The quality of research programs in KIST to enhance its ability to assist industry in developing advanced technologies has been improved.

- The opportunity for joint research activities in the basic sciences has been increased through strengthening common facilities at KBSC.

- The development and application of industrial standards through strengthening NITI has been enhanced.

16. Impact of Project. The impact of the project is positive on all three institutions. The assessment is as follows:

(a) KIST

KIST was established in 1966 as Korea's first modern multi-disciplinary research institute covering a broad spectrum of applied research activities. It is also responsible for providing technical services to small and medium industries. KIST has been successful in these activities as witnessed by the extensive commercialization of R&D results and the licensing of industrial know-how to industrial firms. However, KIST as a major research institute in Korea needs to install and upgrade new equipment continually in order to promote technological innovation and support the move towards more technology-intensive industry. In this regards, the 210 items of new equipment in KIST represent a key factor in improving the quality of research

programs and have also contributed to the ambitious "KIST 2000" research program which is designed to increase future-oriented developments in key fields of technology. Approximately 95 researchers benefited from overseas research. The project's positive impact is therefore obvious.

(b) KBSC

In order to promote a more rational and efficient use of expensive research equipment in the basic sciences, KBSC was established in 1988 by MOST. One of KBSC's major functions is therefore to provide common facilities and equipment for basic research. In line with this purpose, the project supplied 69 pieces of equipment which were more effectively used in a centralized location than in individual institutions. The Bank's assessment is that the newly equipped laboratories have enhanced significantly the quality of joint research programs and expanded joint research efforts by scientists from universities and the national research institutes. The number of joint research projects increased from 1,511 in 1991 to 2,481 in 1994 and the number of samples tested for outside users increased from 6,873 in 1991 to 15,720 in 1994.

(c) NIRI, now NITI

NITI under the jurisdiction of MTI has a main center in Seoul, eleven Regional Industrial Technology Institutes (RITIs), and a specialized center. The equipment installed in the main center included chemistry, machinery/ metallurgy and electronics, and the equipment installed in the PITCs was related to basic analysis to reinforce quality control and legal tasks required by applicable legislation. The newly acquired equipment strengthened NITI's capacity to develop and apply more rigorous industrial standards which would contribute to raising the quality of industrial products. NITI's annual research programs increased from 32 projects in 1990 to 121 in 1994 and technical assistance to SMIs increased from 662 enterprises in 1990 to 1309 in 1994. The impact on NITI, therefore, was also positive.

G. Project Sustainability

17. The Government's continued emphasis on science and technology assures the sustainability of this component. KIST has been, and will continue to be, Korea's leading multisectoral R&D institution and therefore will continue to receive strong government support. The enhanced research capacity in KIST would improve its ability to support industry in developing advanced technologies thereby reinforcing technology development, especially among SMIs, as the engine of growth in the Korean economy.

18. To enter the ranks of technologically advanced countries, the Government is placing strong emphasis on research in basic science, the very foundation of technological development. This is to achieve the objective of reinforcing local creative abilities in science and technology which in turn would strengthen Korea's capacity for technological innovation and reduce dependence on imported technology. KBSC was established as a leading

institution to meet this priority. Therefore, this will make KBSC sustainable in the future.

19. NITI derives its function from its legal responsibility to carry out tests and analyses under laws relating to weights and measures, industrial standards, industrial product quality control, safety and energy consumption. NITI has always played an important role in supporting SMIs but with the Government's increasing emphasis on SMI development, NITI's support role is also expanding. It therefore seems certain that there will be no sustainability problem with NITI.

H. Bank's Performance During Project Cycle

20. Major Strengths and Weaknesses. Bank's performance on this project was in general satisfactory. Processing of the previous projects has led to the development of standardized documentation for preparation and implementation. These contain the necessary information in readily accessible form. This has reduced substantially the number of staff weeks required for project design, processing and implementation, thus increasing the cost-effectiveness of project activities. More specifically, the time spent on the early part of the project cycle, from identification to loan signing was 20.2 staff weeks, which is significantly lower than the 33.5 staff weeks for the first Technology Advancement Project (TAP I). Bank staff contribution during implementation was also satisfactory in providing timely assistance on how to avoid procurement delays and a possible extension of the Closing Date. This was achieved with total staff input for supervision of 8.9 staff weeks (Table 10) compared to 23.7 staff weeks for TAP I. This also reflects the strong cooperation the Bank received from highly competent local officials.

21. Lessons Learned. Given that the project was the third in the series and was successfully implemented, there were no major lessons to be learned. One minor lesson was the need for flexibility in applying procurement guidelines in the situation when NITI neglected the announcement of the GPN. If it had been labeled as misprocurement, substantial delay in equipment procurement would have ensued. Considering Korea' strong performance in equipment procurement in many projects, finding an appropriate compromise for NITI was a reasonable solution.

I. Borrower's Performance During Project Cycle

22. Major Strengths and Weaknesses. The performance of the three institutions was in general satisfactory. The actual implementation of the project had been slow in KIST, and thus KIST requested extension of loan closing date in April 1993. This request was denied on the basis that Korea was an advanced borrower nearing graduation from IBRD. Implementation of the technical assistance component (introduced through the amendment of the Loan Agreement in May 1993) fell slightly short of the allocation amount by US$0.3 million (para.12). However, this amount was reallocated to equipment and full disbursement of KIST's loan allocation was achieved. The performance of KBSC was fully satisfactory. Despite initial delay in implementation due to the jurisdictional change from KOSEF to KRISS, KBSC made significant progress per Bank's advice, and full disbursement was achieved within the grace period.

Equipment procurement went ahead of schedule in NITI during the initial stages. As noted previously, there was a problem with the GPN announcement but this was resolved satisfactorily and did not adversely affect implementation. The cancelled amount of $213,448.13 out of $30.0 million was negligible, and therefore the performance of NITI should be regarded as satisfactory.

23. Lessons Learned. As noted previously, there were no major lessons to be learned.

J. Project Relationships

24. Impact of Relationships on Project Implementation. The relationship between the Bank and the three institutions in this project was excellent throughout the project implementation period. Early emphasis by Bank staff on implementation requirements and the receptiveness of competent local staff to this advice contributed significantly to the successful outcome. No major implementation problems arose. MOF cooperated successfully with the project institutions in ensuring that Part II of the PCR for each institution was prepared on schedule. Other relationships, such as those between the Bank and the two related ministries and those between component institutions and industry were satisfactory.

K. Consulting Services

25. There were no consulting services in this project.

L. Project Documentation and Data

26. Adequacy of Staff Appraisal Report, Major Working Papers and the Legal Agreement. There is no evidence of any inadequacy in the Staff Appraisal Report, the working papers or the Loan Agreement.

PART II. PROJECT REVIEW FROM BORROWER'S PERSPECTIVE

KOREA INSTITUTE OF SCIENCE AND TECHNOLOGY (KIST)

A. Objectives of the project

As industry has become more technology intensive, there has been an increasing need to develop the local capacity for technological innovation thereby reducing reliance on imported technology.

This requires an increasing commitment by KIST to carry out research programs on highly advanced technology. Such research has focused on topics which may be beyond the capacity of the private sector for reasons of affordability and lack of advanced facilites and qualified researchers.

The main objective of the KIST project has been to strengthen KIST's research capacity to reinforce physical facilities and research manpower by means of overcoming shortage of advanced equipment and replacement of obsolete instruments.

Thus, KIST has been playing an effective role in conducting research and development activities for promoting future oriented high technology.

B. Evaluation of Project Implementation

a. Project Cost

(Unit: Million US$)

Category	Estimated Cost			Actual Cost			%age Cgange		
	Local Costs	Foregin Costs	Total Costs	Local Costs	Foregin Costs	Total Costs	Local Costs	Foregin Costs	Total Costs
KIST	4.0	15.4	19.4	3.5	15.0	18.5	12.5	2.5	4.6

b. Project Financing

(Unit: US$ Million)

Source of Funds	Planned	Actual	%age Change
Equipment and Materials	13.5	13.68	101.3%
Book & Journals	0.50	0.54	108.0%
Technical Assistance Program	1.00	0.83	83.0%
Total Project Costs	15.00	15.02	100.1%

c. Project Implementation

Name of building or lab. or Workshop	Planned Completion Date(Month/Year)	Actual	Months of Delay (or advance)
Civil Work	-	-	-
Equipment	Dec. '93	July. '94	7
Technical Assistancs (If any)	June. '94	July. '94	1
Books and Journals	June. '94	May. '94	(1)

C. Direct Benefits of the Project

Execution of the IBRD Loan(3315-KO) Project has resulted in reinforcement of the necessary research equipment, and in modernization of common use test ; equipment for supporting basic & sophisticated research, which will serve as a cornerstone for KIST to upgrade its research capacity to carry out more advanced high technology R&D activities.

Besides the national research projects, KIST has been able to embark on new ambitious KIST 2000 research programs which are designed to increase potential to make more creative and future-oriented technological advancements in such fields as medical welfare technology display devices for information industry, precision materials processing, three dimension imaging media, and the human robot system.

In particular, more then 210 kinds of research equipment were purchased during the project period, and more than 95 researchers benefited from overseas research based upon the IBRD Loan, which also enabled the project to mark a great contribution to the substantial development of the institute.

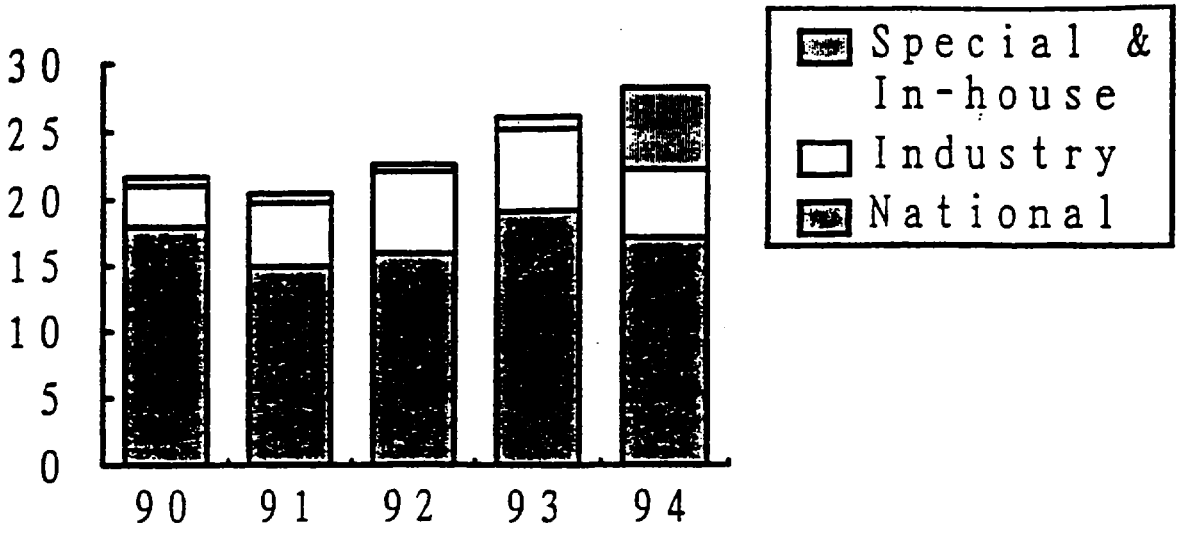
Beginning in 1991, a program of collaborative research and study was initiated at KIST that drew students and researchers from academic institutions and research organizations. With the aim of training a high-caliber workforce both in theory and practice, the program has been implemented recruiting 250 students in collaboration with several major universities throughout Seoul.

1. Annual Research Budget

(unit: Million Won;(Number of Research Project))

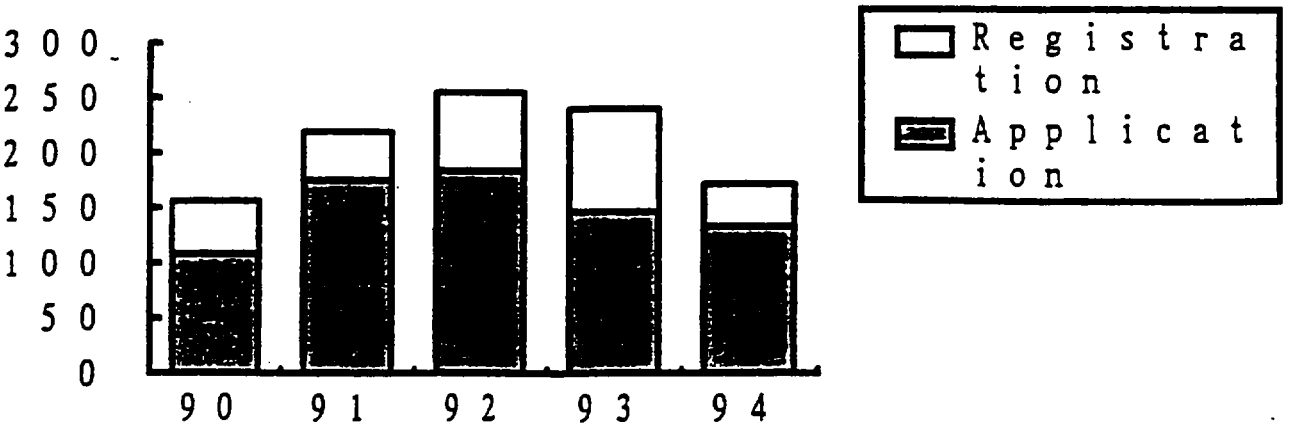
Item	'90	'91	'92	'93	'94 (Sept.)
National Project	17, 915 (148)	14, 637 (162)	16, 212 (188)	18, 760 (207)	16, 574 (87)
Industry Sponsored Project	3, 236 (35)	4, 689 (66)	6, 258 (96)	6, 319 (93)	4, 496 (46)
Inhouse Project	772 (61)	768 (68)	535 (38)	971 (46)	5, 862 (71)
Total	21, 923 (224)	20, 094 (296)	23, 005 (322)	26, 050 (346)	26, 932 (204)

(Unit: Billion Won)



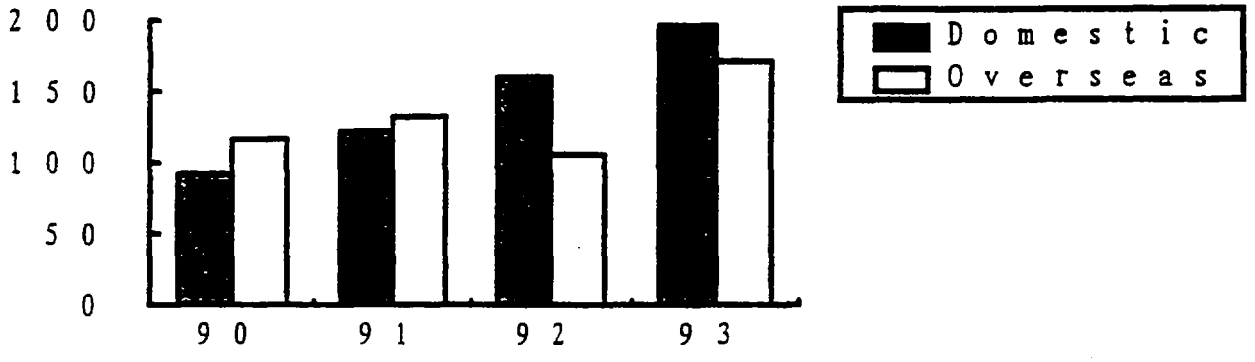
2. Record of Patents

Item		'90	'91	'92	'93	'94 (Sept.)
Application	Domestic	61	71	95	110	93
	Overseas	47	104	89	37	41
Total		108	175	184	147	134
Registeration	Domestic	38	29	33	56	22
	Overseas	10	15	38	37	16
Total		48	44	71	93	38



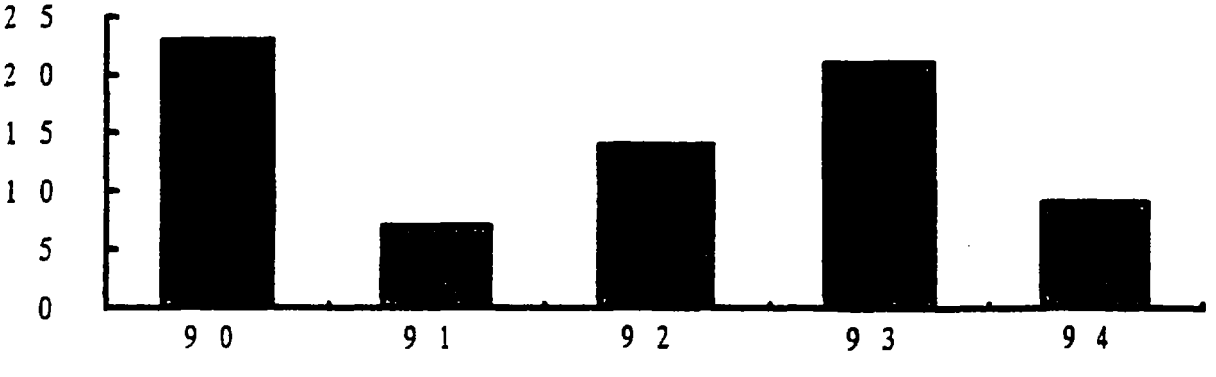
3. Record of Thesis Publication

Item	'90	'91	'92	'93
Domestic	92	122	160	196
Overseas	116	132	105	171



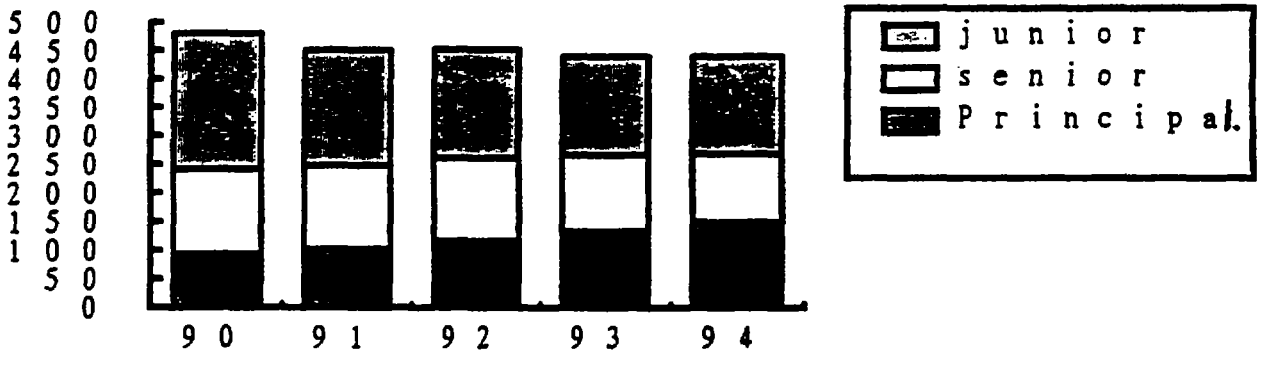
4. Number of Research Results Transferred to Industry

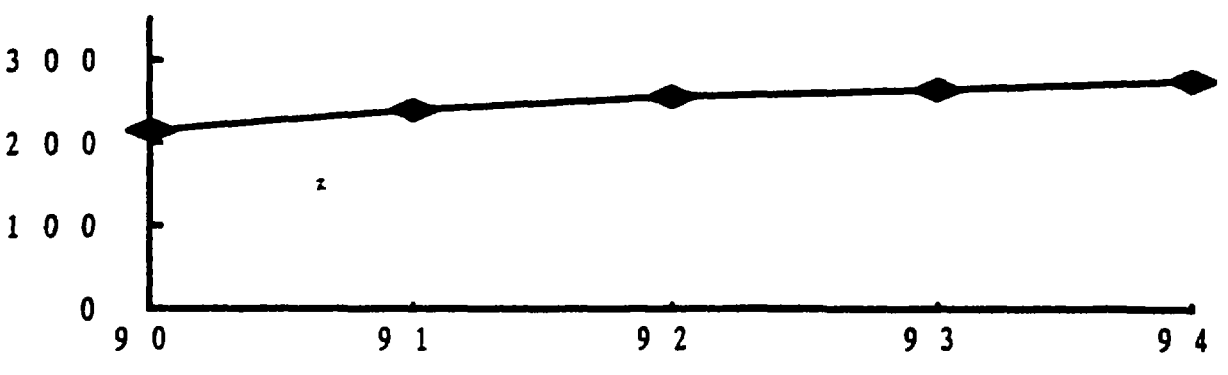
Item	'90	'91	'92	'93	'94 (Sept.)
Number of commercialized	23	7	14	21	9



5. Number of Research Personnel

Item	'90	'91	'92	'93	'94 (Sept.)
Principal	93	102	117	133	149
Senior	148	146	144	133	120
Junior	239	203	192	174	171
Total	480	451	453	440	440
Doctorate	215	240	256	264	274





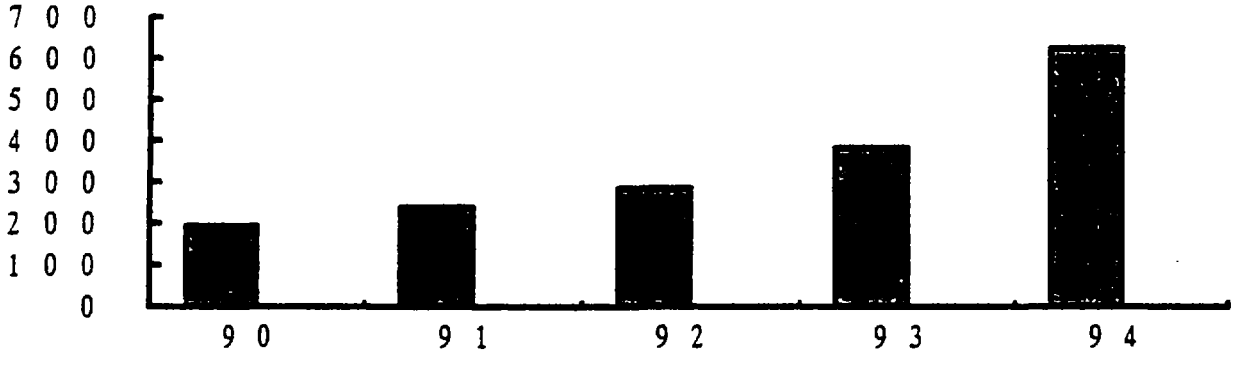
Trend of docetorate incremental

6. Annual Budget

(Unit: Million Wom)

Item \ Year	'90	'91	'92	'93	'94 (Sept.)	Total
Personnel Cost	7,395	8,413	9,365	16,153	17,807	59,133
Repayment of Loan Principal & Interest	1,562	2,842	3,352	3,422	5,309	24,705
Research Expenditure	4,255	5,485	8,253	10,719	30,923	59,635
Recurrent Cost	6,170	7,165	7,521	7,877	8,233	36,966
Total	19,355	23,905	28,491	38,171	62,272	

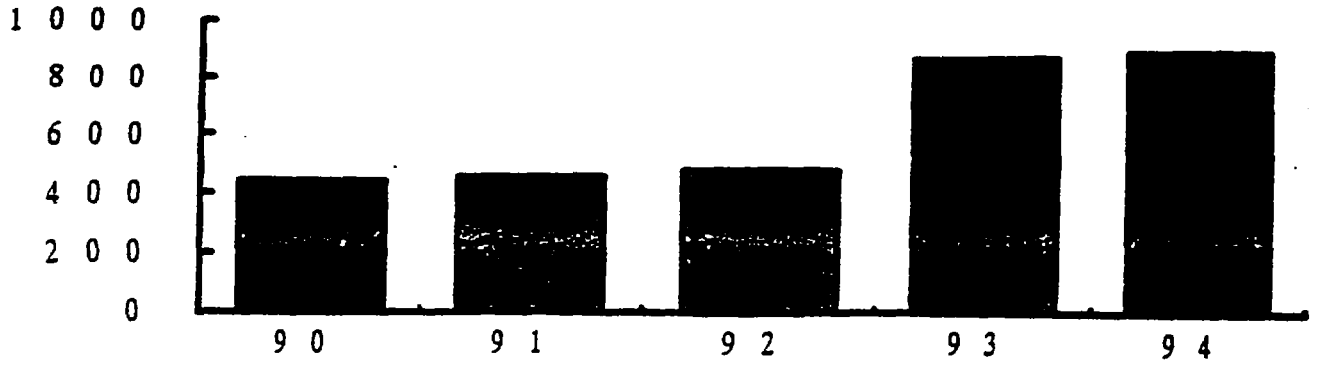
(Unit: 1,000 Thousands Million Won)



7. Annual Purchase of Research Equipment

(Unit: US$1,000)

Year	Item	Amount
'90	439	5,008
'91	455	7,054
'92	478	5,026
'93	869	8,090
'94 (sept.)	892	5,874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9 4

Project Completion Report
Korea
Third Technology Advancement Project
(Loan 3315-KO)

October 25, 1994

Korea Basic Science Center

Contents

Part II. Project Review from the Borrower's perspective

1. Objectives of the project

The project was the first phase of a large master plan aimed at improving opportunities for joint research activities in the basic research through strengthening common research facilities and equipments at KBSC.

2. Benefits from the projects

2.1 KBSC could be committed by the project to support the mission of the MOST(Ministry of Science and Technology) in serving the needs of university faculty members and professionals from public and private R & D institutes by helping to build and operate the unique and state-of-the-art equipment as well. (Table 1, 2)

2.2 The project would lead to improved research cooperation between center, university and industry through more efficient of research equipments and facilities for basic research. (Table 3)

2.3 KBSC helps to prepare the scientific and technical work force of the future by offering a variety of learning and R & D experiences to graduate students and faculty members(Table 4)

2.4 Close relationship between Bank staff and the executing department has yielded several institutional benefits to the KBSC.

3. Bank's performance

3.1 Bank personnel were recognized as professional in all respects. Not only mission members were always highly qualified in their respective fields but also staff appraisal report was appropriate to address the kinds of implementation problems occurring.

3.2 The constructive dialogue and Bank's supervision effort was quite beneficial.

3.3 However, sometimes we were not able to get some paper works.(Payment Advice, Monthly Disbursement Summary)

4. Lessons learned

4.1 The overall communications between the Bank and the Borrower, including accounting of commitments and draw-down of loan proceeds, should be sufficiently well documented and thoroughly understanded so that when the changes in government or mission personnel occur such changes will deeply affect project implementation.

4.2 The performance of the participating institutions in overall project planning should be reviewed to compare the results.

4.3 A specialist and manual should be made available to make a thorough review of equipment specifications before going out to tender. And clearly stated responsibilities about warranty should be pointed out in equipment specifications.

4.4 Bidding and reimbursing procedures should be fully recognized not to take much time in preparing and getting documents.

5. Project sustainability

5.1 The sustainability of economic benefit is to provide reliable utility support and the additional necessary infrastructure required to produce the appropriate environment for conducting outstanding research.

5.2 In terms of technology progress, new scientific research fields came into being as a result of newly acquired equipment and we were able to commit education program on state-of-the-art equipment.

5.3 The users are strongly recommended to carry out research in the basic sciences to ensure a national competence and knowledge in research and development.

6. Conclusion

6.1 During the past year, significant effort was expended a working administrative framework for each of the equipments and KBSC has continued its outreach programs, ranging from the dissemination of

information about facilities to the development of extensive contacts through the headquarters and nation-wide branches. Therefore, remarkable progress was made in relatively short periods of time.

6.2 Plans for the future involve the expansion of such efforts and the assumption of additional responsibility in facilitating scientific education programs.

6.3 The upcoming year will see completion of many of the activities developed during the current year.

6.4 R & D interactions between university and industry should be greatly increased by more exchange of knowledge, personnel and collaborative projects.

6.5 We shall continue to develop our basic understanding of the stricture of our activities so that we can define meaningful measures of progress.

6.6 We believe that our enriched research equipments, when fully set up, will make constructive changes to revitalize the university and industry research so that our wealth of talent and facilities will contribute more effectively to our research capacities and economic growth.

Table 1.

NUMBER OF RESEARCH SERVICES AT KBSC

year	cases	samples	users	guests
1991	1,511	6,873	704	408
1992	1,542	8,151	811	465
1993	735	4,780	366	147
1994 9 at present	2,481	15,720	1,926	867
Total	6,269	35,324	3,807	1,887

Table 2.

NUMBER OF EQUIPMENT AND FACILITY BY FIELD

Sep. 1994

Field	Number
Biology	16
Chemistry	22
Earth Science	9
Physics and Plasma	22
Total	69

Table 3.

RESEARCH WORK AFTER THE PROJECT

(unit : thousand won)

project name	budget	source
1. Studies on the analytical methods of the isotope and trace element geochemistry and the microtexture of geological materials	105,000	Government
2. Structure Analysis of Large Molecules by Ultra Resolution Tandem Mass Spectrometry and High Field NMR	110,000	Government
3. Development of Advanced Techniques for the Installation and Improvement of the Extreme Science Research Devices	175,000	Government Industry
4. Performance Evaluation and Efficient Utilization of the Instruments for Biomolecule Analysis	75,000	Government
5. Development and Production of Natural Insulin with normal functions	87,500	Government
Total	552,500	

Table 4.

EDUCATION PROGRAMS('94)

Equipment Name	Number of participation(*)	Remarks
1. Protein Sequencer	7	
2. DNA Sequencer	20	
3. Tandem Mass Spectrometer	47	
4. Nuclear Magnetic Resonance Spectrometer	21	
5. Thermal Ionization Mass Spectrometer	23	
6. Stable Isotope Ratio Mass Spectrometer	19	
7. 9 Tesla Superconducting Split Magnet System	15	
8. 20 Tesla Superconducting Magnet with $^{3}He/^{4}He$ Dilution Refrigerator System	24	
Total	176	

* Number of participation consist of graduate student, fault member and industry

About KOREA BASIC SCIENCE CENTER

Today science and technology development competition both at home and abroad is growing ever fiercer to the point of hegemonism. Korea, therefore, must achieve indigenous technology development, and first and foremost must implement basic science research as a technology often finds its application in science after all.

To reach world-class competitiveness in technology, basic science R & D capability becomes a matter of great importance, so the center installed state-of-the-art measurement and analysis equipment within its aggressive National User's Facility, founded in August, 1988, to promote basic science research at universities and in industry. In addition the Center is striving to lay a solid foundation for creative, advanced science and technology activities to develop programs conducive to the more effective use of equipment and to conduct research to improve research to improve research applications and interpretation of analysis results, the better to exploit the great potential of the universities. To this end the Center has set up its headquarters at Taeduk Science Town and established four Branches (Seoul, Taegu, Pusan, and Kwangju) for systematic support and as an omphalos for cooperative, joint research all over the nation.

Our Taeduck Headquarters is building up a cooperative research system for academia, industry, and institutes. In particular , we will contribute greatly to overcoming the obstacles to domestic advanced research, by installing ponderous upgraded measurementanalysis equipment, thereby greatly expanding internal measurement and analytical capacities. The branches under construction, are expected to help boost regional technology development by securing analytical support through the use of region-specialized precision instruments to provide an interdisciplinary joint research arena.

We plan initiate and manage a visitor research system focusing on performance excellence. This will entail the Center's maintaining a minimum staff for its operation and then researchers, both local and foreign, can take advantage of the Center for creative joint research. We will thus also reinforce international collaboration, and prompt exchanges between leading research groups abroad while attracting brand-new expertise into the Center in relation to the installation and operation of facilities.

The Center will thus provide a convenient system giving domestic researchers free access to facilities beyond their own means for cooperative research up to with international standards. In essence, the Center will not only play a catalytic role in supporting the research of many scientists in universities and institutes but will also become a central forum where our own basic science researchers can carry out joint research. Partly KBSC will continue to be dedicated to acting as the driving force behind innovative science and technology, and we will do everything in our power to propel Korea into a new era of science culture.

ANNEX 2

Brief History

1987. May	A public hearing is held to establish the Korea Basic Science Center(KBSC).
1988. Aug.	KBSC established as an affiliate of the Korea Science and Engineering Foundation.
1988. Aug.	Dr. Hyun-Nam Kim appointed first president.
1989. Sep.	KBSC temporary office is opened in Seoul.
1990. Aug.	Dr. Bak-Kwang Kang appointed second president.
1990. Dec.	Started construction of KBSC headquarters in Taeduck
1991. Oct.	KBSC reorganized under the auspices of Korea Research Institute of Standards and Science.
1992. Mar-Apr.	Four regional branch offices(Seoul, Pusan, Taegu. and Kwangju) established
1992. Dec.	Taeduck headquarters construction completed
1993. Apr.	Dr. Byong-Kwon Park appointed third president.
1993. May.	KBSC became an affiliate of Korea Research Institute of Standards and Science.
1993. Aug.	Moved into Taeduck headquarters

ANNEX 3

Function

Headquarters

Promote and activate high quality research in the basic science through joint use of equipment in selected fields of national importance by

1. Install and operate the National User's Facility and Measurement Center
2. Construct joint research system using advanced equipment
3. Study interpretation and analysis of measurement results and develop educational training program

Play a pivotal role in basic science research and information dissemination by

1. Exchange information with Scientific Research Center and Engineering Research Center(SRC, ERC), and reinforce cooperation in basic science research field
2. Establish science information center for basic research with scientific journals

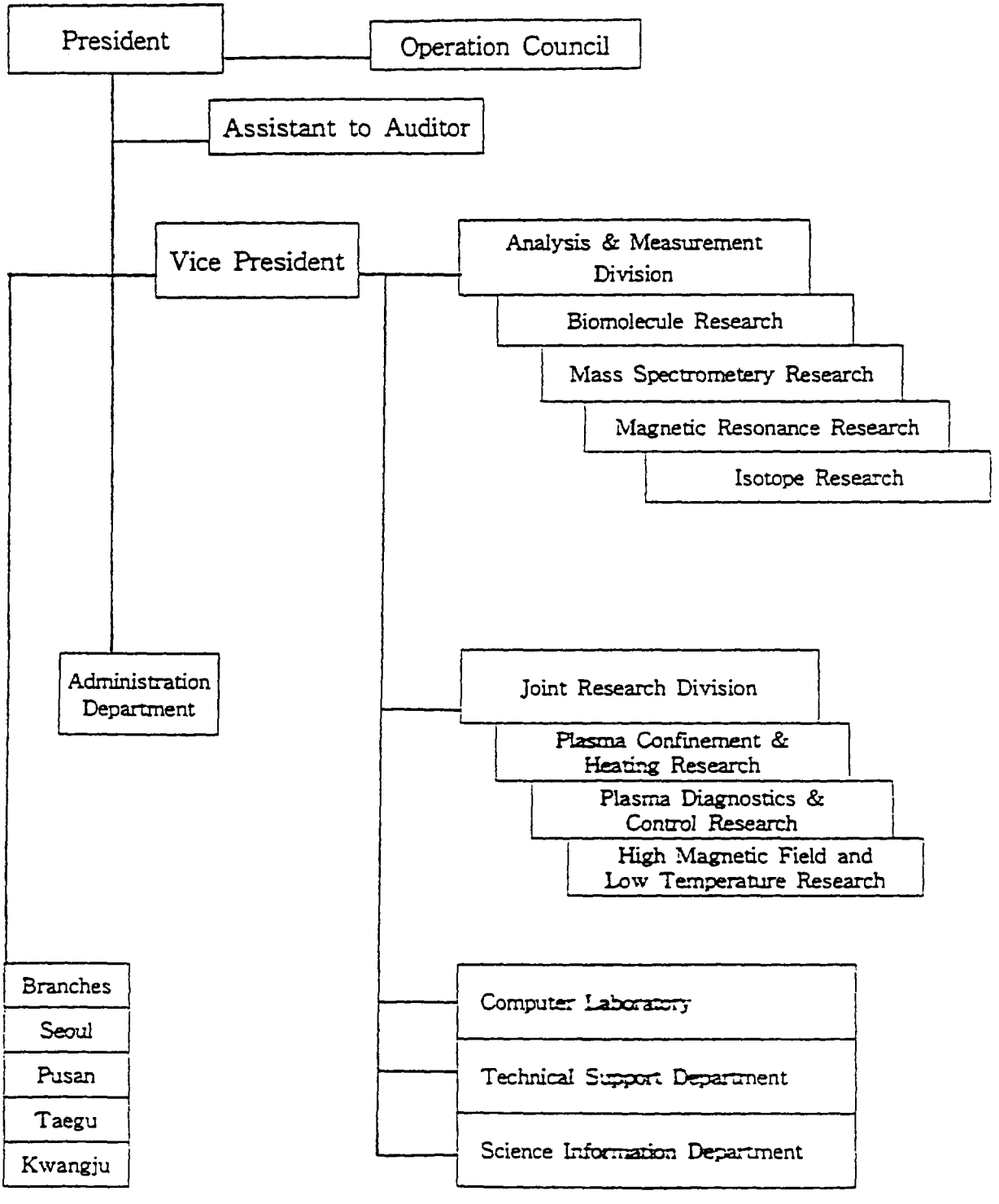
Branches

Conduct joint research with regional scientific studies and exchange information by

1. Support joint use of equipment appropriate to the research activities and university characteristics of each region
2. Provide measurement and analysis service for the regional university research community and industry
3. Offer educational programs and practical training opportunities related to super accurate equipment

ANNEX 4

Organization



ANNEX 5

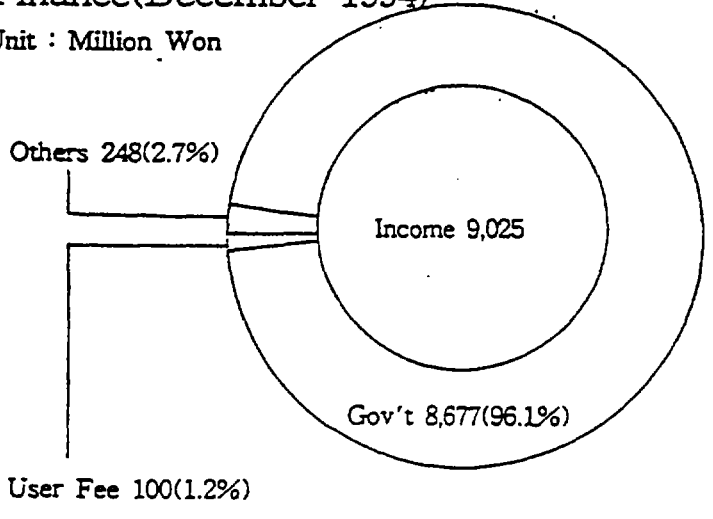
Finance & Personnel

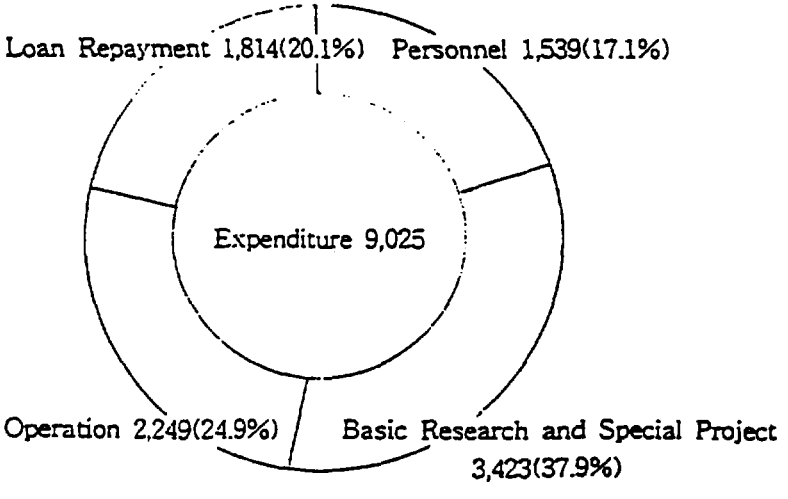
Personnel(September 1994)

Executive	1
Researchers	56
Engineering Staff	33
Administration Staff	37
Total	127

Finance(December 1994)

Unit : Million Won





PROJECT COMPLETION REPORT

Third Technology Advancement Project
(Loan 3315 - KO)

October, 1994

National Industrial Technology Institute
(N I T I)

A. Objectives of Project

The main objective of the NITI's project was to reinforce test, analysis and assessment facilities required to

- satisfy demands of test, analysis and assessment which are being specilized and highly advanced day by day,
- carry out the testing for quality improvement of the industrial products and maintenance & management of the national industrial standards,
- support hi-tech development of medium & small enterprises.

During the project period, NITI has purchased 402 sets of precision equipment for test, analysis and assessment which are indespensable in technological advancement, and secured highly advanced testing, analysis and assessment capabilities for supporting hi-tech industrial development in '90s and the 21st century-type leading medium & small enterprises.

The additional effects achieved during the project are as follows :

1. NIRI renamed as NITI
   : National Industrial Research Institute(NIRI) was renamed as National Industrial Technology Institute(NITI) in order to activate supporting capacity of industrial technology on December, 1991.

2. Expansion of Organization
   : NITI established two Regional Industrial Technology Institutes to reinforce technological support for provincial industry.
   - December 2, '91 : Established Regional Industrial Technology Institute of Kyungnam
   - July 1, '93 : Established Regional Industrial Technology Institute of Incheon

3. Reinforcement of Manpower

a) Increase of the Personnel

	Before the Project(FY '90)			Present(FY '94)		
	Total	H.Q NITI	Regional NITI	Total	H.Q NITI	Regional NITI
Researcher	311	142	169	374	162	212
Technician	162	101	61	146	73	73
Administrative	46	19	27	74	22	52
Total	519	262	257	579	257	337

b) Improvement in Manpower Level of Researcher

	Before the Project(FY '90)		Present(FY '94)	
	Number of Researcher	Rate(%)	Number of Researcher	Rate(%)
Doctor	15	4.8	47	12.6
Master	110	35.4	157	42.0
Bachelor	186	59.8	170	45.4
Total	311	100.0	374	100.0

4. Establishment of Specialized Technology Center

- January, 1992 : Reliability Evaluation Center
- March, 1993 : Electric Cooling/Heating System Lab.
- July, 1993 : Electro Magnetic Compatibility Lab.
- July, 1993 : Thin Film Technology Center
- October, 1993 : Heat Treatment Technology Center
- December, 1993 : Precision Machining Lab.
- May, 1994 : Precision Analysis Lab.

5. Establishment of Pilot Plant

- March, 1992 : Surface Treatment
- March, 1992 : Rubber Pilot Plant
- April, 1992 : Dyeing & Finishing of Textile
- May, 1992 : Plastic Injection Molding Plant
- October, 1993 : Heat Treatment Pilot Plant
- October, 1993 : Precision Parts Machining Plant
- November, 1993 : Ceramic Materials Refining Plant
- November, 1993 : Ceramics Design Plant

B. Performance on Implementation

1. Project Cost

(Unit : US$ million)

Category	Estimated Cost			Actual Cost			%age Change		
	Local Costs	Foreign Costs	Total Costs	Local Costs	Foreign Costs	Total Costs	Local Costs	Foreign Costs	Total Costs
NITI	9.4	31.4	40.8	13.7	29.8	43.5	45.7%	-5.1%	6.6%

2. Project Financing

(Unit : US$ million)

Source of Funds	Planned	Actual	%age Change
Equipment	31.4	29.8	-5.1%

3. Project Implementation

(Unit : US$ million)

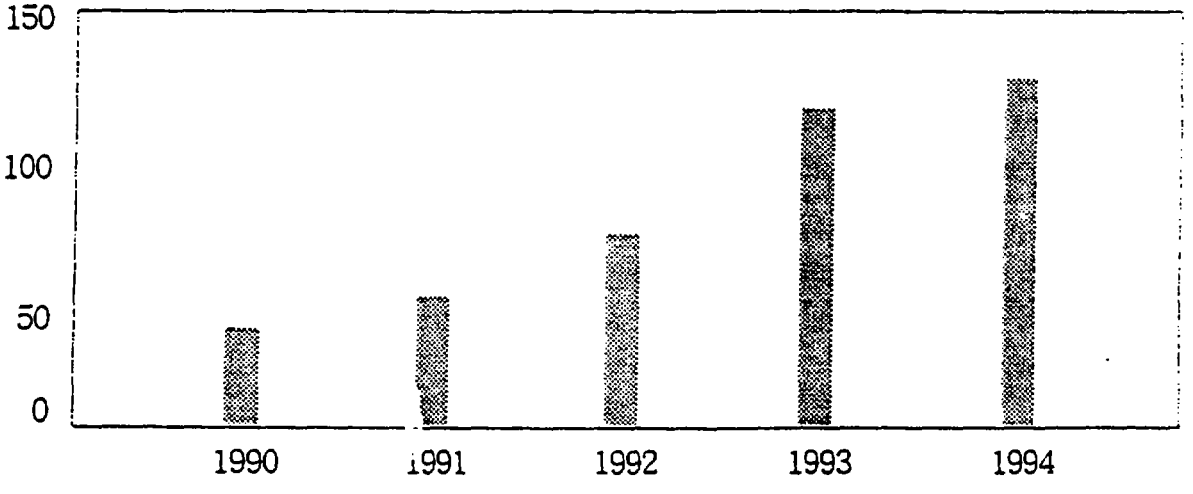
	Planned Completion Date(month/Year)	Actual	Months of Deley (or advanced)
Equipment	June, 1994	July, 1994	1

C. Benefits from the Project

1. Annual Research Projects

Item	'90	'91	'92	'93	'94
· NITI Selected Research	16	25	51	56	45
· Industrial Basic Technology	14	11	14	11	15
· Industry Requested Research	-	-	1	38	48
· International Joint Research	2	10	10	10	13
Total	32	46	76	115	121

Trend of Annual Research Projects



2. Additional Number of Test & Research Field

Additional Test & Research Field	Number of Field
· Analysis of Chemical Elements and Ingredients	5
· Analysis of Structures	4
· Thermophysical Properties of Materials & Products	8
· Highly Advanced Measurements	6
· Test & Research in Regional Industrial Technology Institute	11
Total	34

3. Thesis Publication at NITI

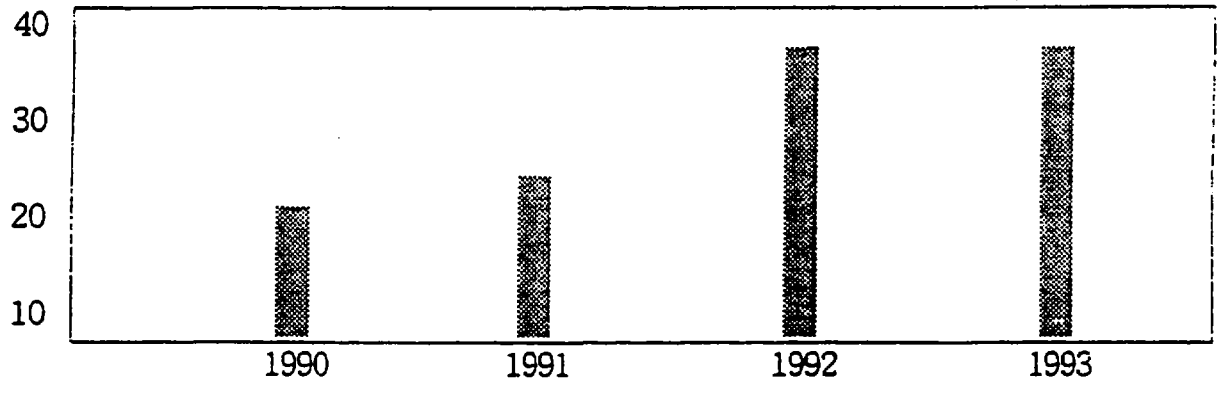
Unit : Number of Thesis

Item	1990	1991	1992	1993
· NITI Selected Research	16	19	31	30
· Industrial Basic Technology	4	3	5	4
· International Joint Research	2	1	2	4
Total	22	23	38	38

Remarks : · NITI published its research reports only when the project had been finished.

· Research results in 1994 will be published in 1995.

Trend of Thesis Publication at NITI

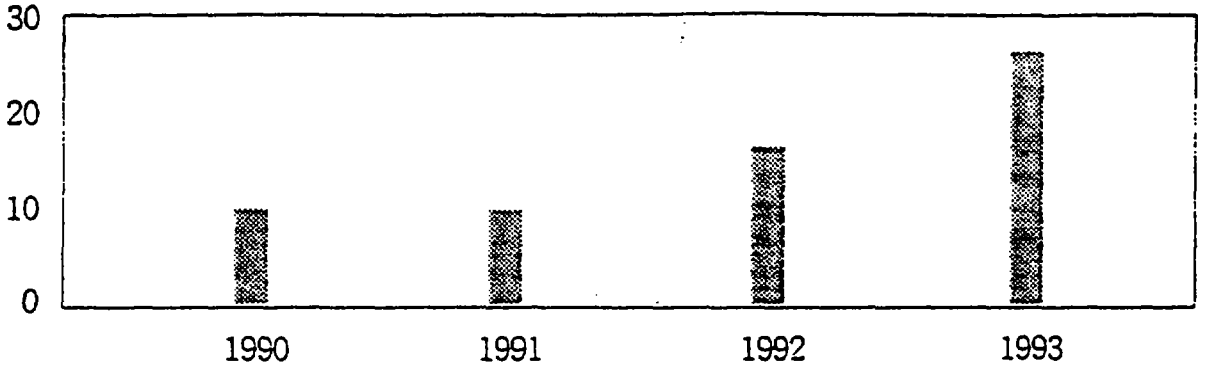


4. Thesis Publication in Journals

Unit : Number of Thesis

Item	'90	'91	'92	'93
Domestic	10	8	13	26
Overseas	-	2	1	2
Total	10	10	14	28

Trend of Thesis Publication in Journals



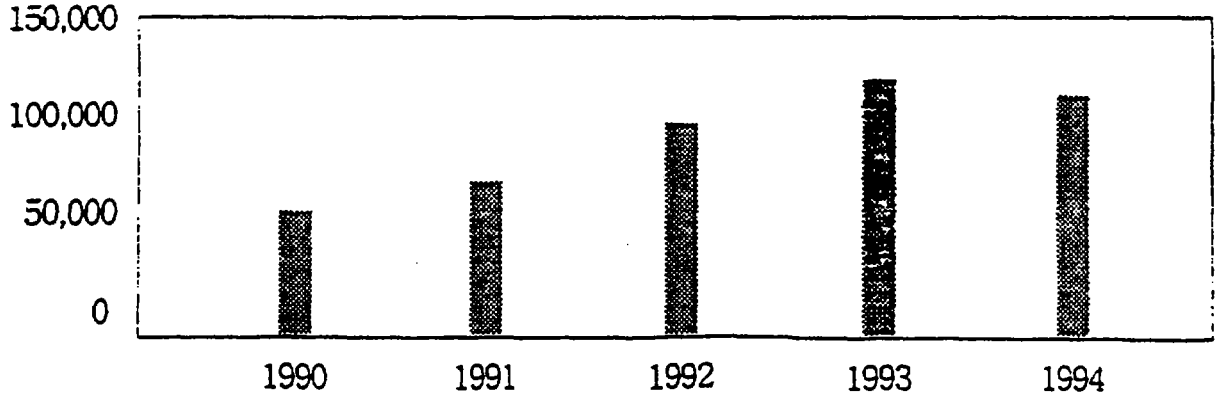
5. Number of Patents

Item	'90	'91	'92	'93	'94
Domestic	1	4	-	6	4
Overseas	1	-	-	-	-
Total	2	4	-	6	4

6. Issued Number of Certificates

Item	'90	'91	'92	'93	'94 (By Sept.)
Number of Certificates	50,020	51,150	98,852	115,875	106,070

Trend of Issued Number of Certificates



7. Technical Assistance to the Small & Medium Enterprises

Unit : Number of Enterprises

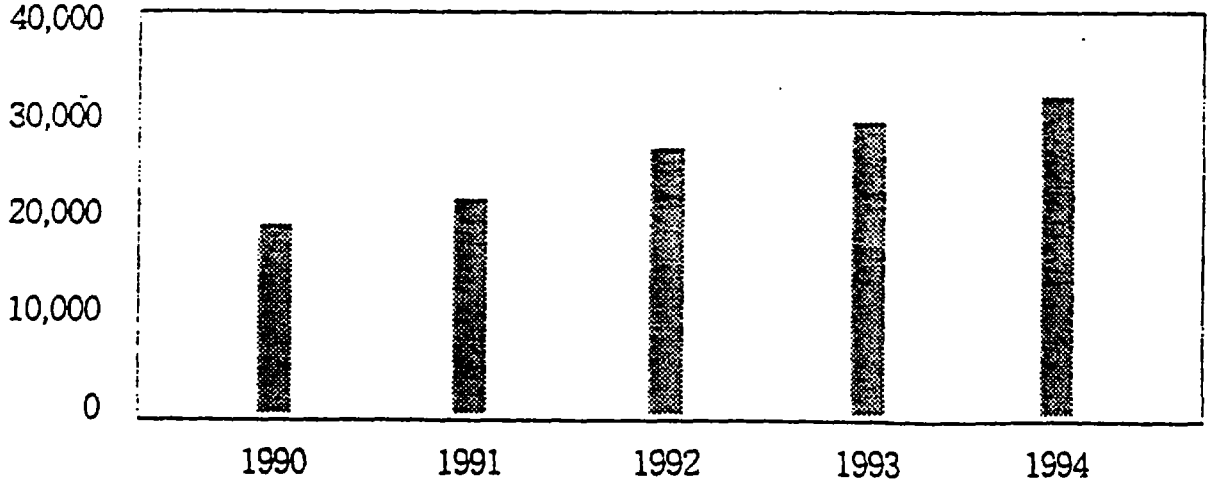
Item	'90	'91	'92	'93	'94
· Difficult Production Technology	662	803	678	693	802
· Home-Doctor Technical Aid	-	-	510	518	507
Total	662	803	1,188	1,211	1,309

8. Annual Budget

Unit : ₩ million

Item	'90	'91	'92	'93	'94
· H.Q. NITI	9,153	10,775	12,882	13,668	15,006
· Regional NITI	7,673	8,642	9,210	12,994	16,613
Total	16,826	19,417	22,092	26,662	31,619

Trend of Annual Budget



LIST OF ANNEXES

D. PROJECT IMPLEMENTATION

Table 4: PLANNED AND ACTUAL COMPLETION DATES OF COMPONENTS

Project Components	Planned Completion Date	Actual Completion Date	Months of delay (or advance)
National Industrial Technology Institute (NITI)			
Equipment	June, 1994	July, 1994	1

E. PROJECT COST AND FINANCING

Table 5: PROJECT COST (US$ million)

COMPONENT	APPRAISAL ESTIMATE			ACTUAL COST			PERCENTAGE CHANGE OF TOTAL
	LOCAL	FOREIGN	TOTAL	LOCAL	FOREIGN	TOTAL	
NITI	9.4	31.4	40.8	13.7	29.8	43.5	6.6 %

Table 6: PROJECT FINANCING (US$ million)

SOURCE OF FUNDS	PLANNED (as in SAR)	FINAL	PERCENTAGE CHANGE OF TOTAL
IBRD Expenditure Categories			
Equipment	31.4	29.8	- 5.1 %
Domestic Financing			
NITI	9.4	13.7	46.8 %

PART III

STATISTICAL INFORMATION
A. RELATED BANK LOANS

Table 1: IBRD/IDA LOANS/CREDITS RELEVANT TO THE PROJECT

Loan/Credit Number Project Title	Year of Approval	Purpose of Project	Status	Comments
Cr.151-KO First Education Project	1969	Expansion of vocational high schools, junior technical colleges and teacher training	Completed 09/76	Successful project Satisfactorily implemented.
Ln.906/Cr.394-KO Second Education Project	1973	Improvement of vocational high schools, junior technical colleges and science, engineering and education colleges.	Completed 12/79	Implemented substantially as planned. Line management evolved from Project Implementation Unit.
Ln.1096-KO Education Project	1975	Expansion and quality improvement in vocational high schools, junior colleges and vocational training institutes (VTIs).	Completed 11/81	Successfully implemented Third with growing experience and competence of local staff.
Ln.1474-KO Vocational Training Project	1977	Further expansion of VTIs, and expansion and improvement of instructor training.	Completed 06/83	PCR concluded that the project was well designed, implemented efficiently and judged it to be an excellent example to Bank/Borrower.
Ln.1800-KO Sector Program on Higher Technical Education	1980	Improving technical colleges and colleges of engineering and management through supply of equipment,staff development, manpower planning, equipment maintenance and academic accreditation.	Completed 02/86	A sector program successfully implemented.
Ln.2427-KO Program for Science and Technology Education	1984	Raising quality of science and technology education to standards required by a more skill - and knowledge - intensive industrial system through planned policy and institutional change.	Completed 06/89	A second sector program successfully implemented with all planned policy and institutional changes fully achieved.
Ln.3037-KO Technology Advancement Project	1989	Strengthening the development of SMI in Technology-intensive sectors, improving the quality of education in a center of excellence in science and engineering education and enhancing the capacity of selected R&D institutions to provide technical support to SMI.	Completed 12/93	Implementation experience of the project was highly satisfactory.

Loan/Credit Number Project Title	Year of Approval	Purpose of Project	Status	Comments
Ln. 3202-KO Second Technology Advancement Project	1990	Improving the research capacity of one leading graduate school in science and engineering and enhancing R and D capacities in the areas of biotechnology, basic and industrial standards, and energy and resource utilization	Effective on 11/08/90	Being implemented
Ln.3203-KO University Science and Technology Research Project	1990	Enhancing basic research programs in selected universities in priority fields in science and technology and improving science teacher training.	Effective on 11/08/90	Being implemented
Ln.3314-KO Vocational Education Project	1991	Upgrading the skill training provided in selected vocational high schools meeting the increasingly complex skill requirements of industry, commerce, agriculture and fisheries.	Effective on 09/03/91	Being implemented.
Ln.3468-KO Science Education and Libraries Computerization Project	1992	Raising the quality of science programs in secondary schools and universities and establishing and inter-library network system to enhance the access of information to students, faculty and researchers.	Effective on 09/09/92	Being implemented.
Ln.3469-KO Vocational Schools Development Project	1992	Continuing with the objectives in Ln.3314-KO to upgrade skill training in selected vocational high schools (VHS) and strengthening VHS system through five studies in five agreed areas.	Effective on 09/17/92	Being implemented.
Ln.3612-KO Environmental Research and Education Project	1993	Upgrading the capacity of selected agricultural & veterinary colleges to undertake research into key environmental problems, reinforcing the environmental aspects of basic science programs in the colleges and establishing appropriate arrangements for improving environmental related research and training programs.	Effective on 09/03/93	Being implemented.
Ln.3693-KO Science and Technical Education Project	1994	Improving science and technical education and research through implementation of an agreed policies and action program and the provision of specialized equipment.	Effective on 05/11/94	Being implemented.

Loan/Credit Number Project Title	Year of Approval	Purpose of Project	Status	Comments
Ln.3694-KO Environmental Technology Development Project	1994	Strengthening: a) selected national research institutes to identify and adequately address environmental issues and to undertake environmental R&D activities and b) the Ministry of Environment's policy and planning role.	Effective on 05/11/94	Being implemented.

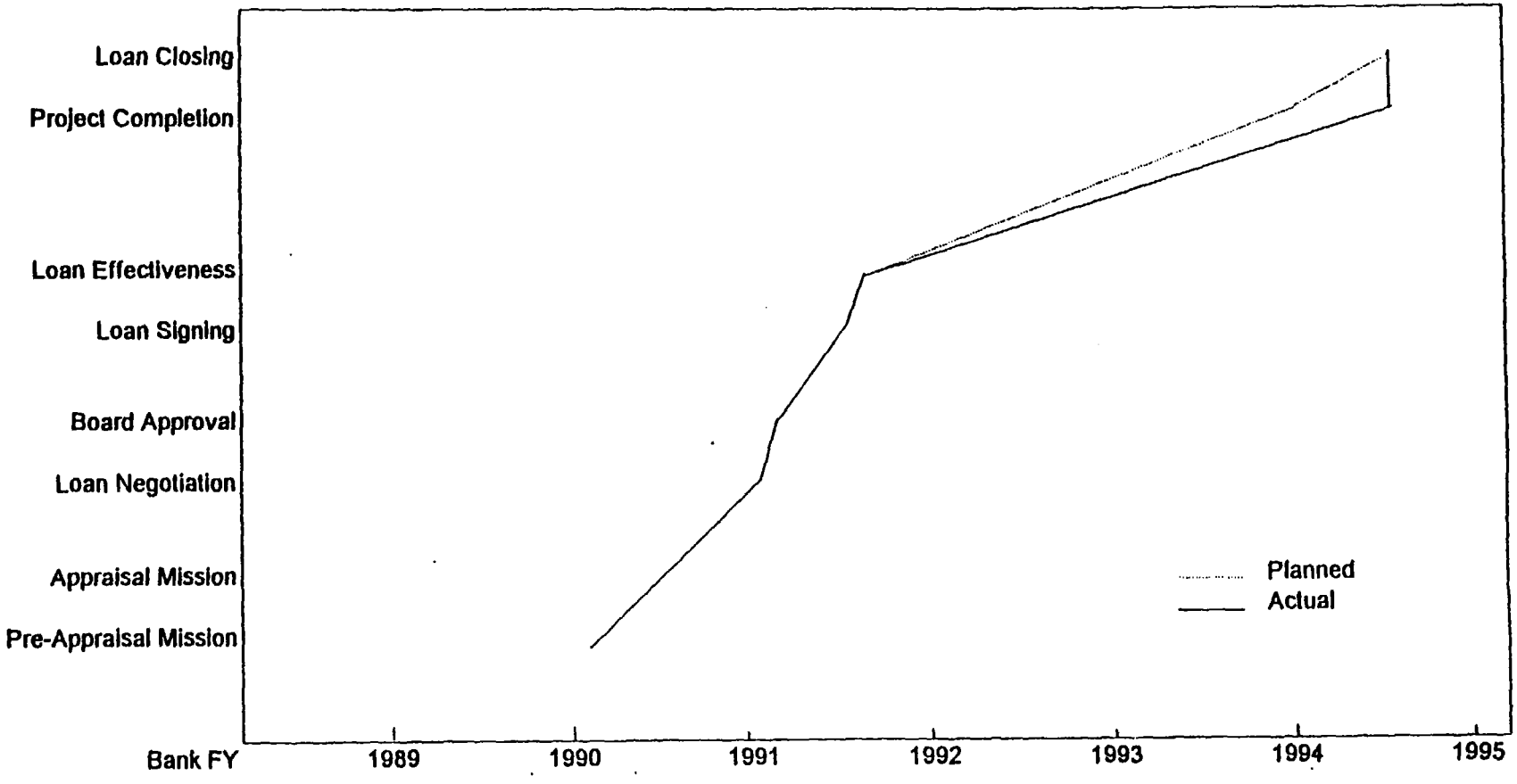
B. PROJECT TIMETABLE

Table 2: PLANNED, REVISED AND ACTUAL DATES OF PROJECT TIMETABLE

ITEM	PLANNED	ACTUAL
Identification Mission	Nil	Nil
Preparation by Government	Feb./Jun. 1990	Feb./Jun. 1990
Pre-Appraisal Mission	Feb./Mar. 1990	Feb./Mar. 1990
Appraisal Mission	June 1990	June 1990
Loan Negotiations	February 5, 1991	February 5, 1991
Board Approval	March 28, 1991	April 2, 1991
Loan Signature	June 3, 1991	June 3, 1991
Loan Effectiveness	September 3, 1991	September 3,1991
Project Completion	December 31, 1993	June 30, 1994
Loan Closing [4]	June 30, 1994	June 30, 1994

[4] Date of closing of the loan account was September 22, 1994 with the cancellation of USD213,448.13, although the loan was closed on schedule on June 30, 1994.

Korea
Third Technology Advancement Project
Time Line of Planned and Actual Project Timetable

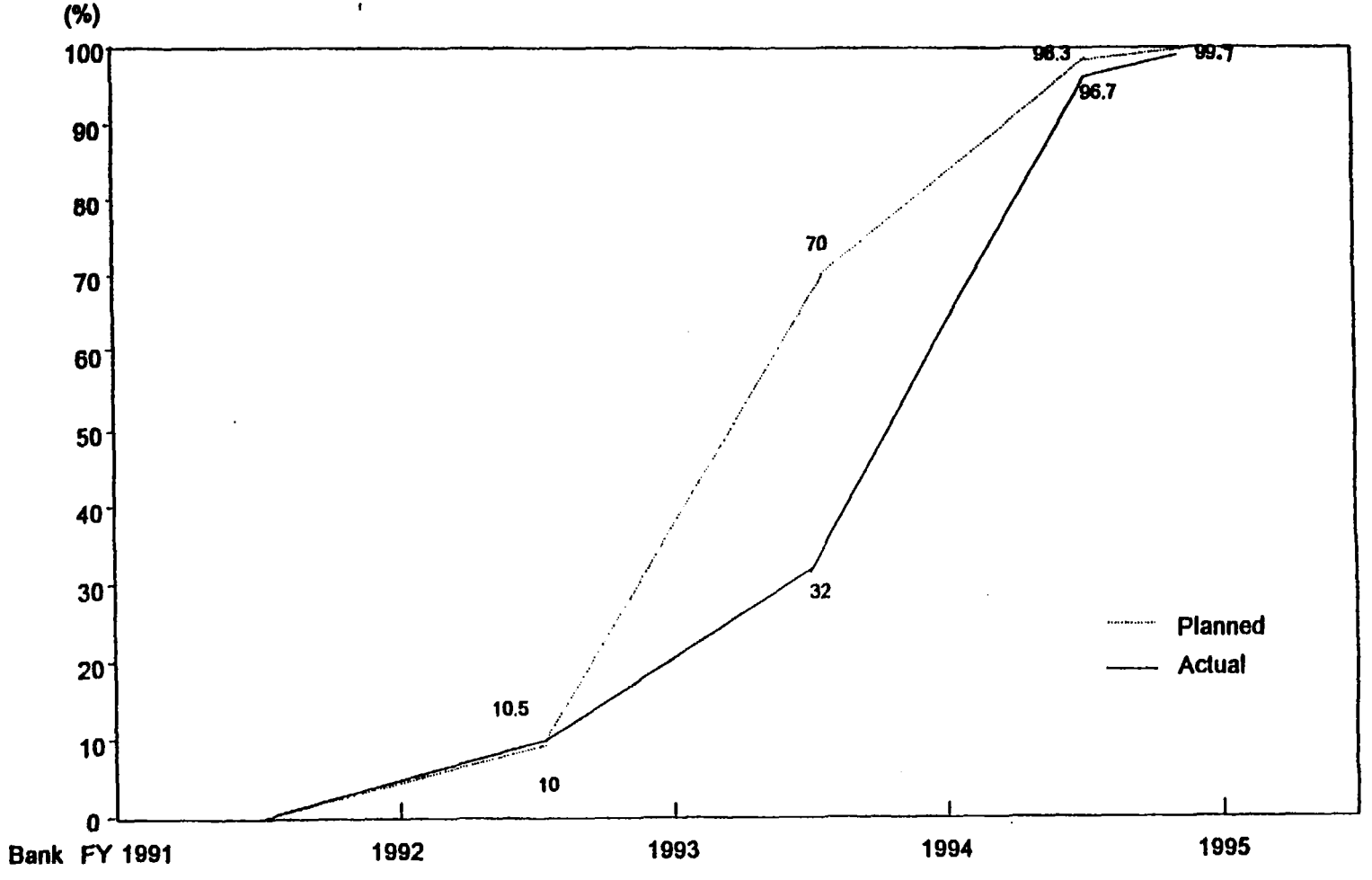


C. LOAN DISBURSEMENTS

Table 3: CUMULATIVE ESTIMATED AND ACTUAL DISBURSEMENT

BANK FY	1992	1993	1994	1995
APPRAISAL ESTIMATES	6.0	42.0	59.0	60.0
ACTUAL	6.3	19.3	58.0	59.8
ACTUAL AS % OF ESTIMATE	105	46.0	98.3	99.7
DATE OF FINAL DISBURSEMENT	September 22, 1994			
DATE OF LAST TRANSACTION FOR FULL RECOVERY OF THE INITIAL DEPOSIT OF US$1.5 million TO KIST.	July 14, 1994			
DATE OF LAST TRANSACTION FOR FULL RECOVERY OF THE INITIAL DEPOSIT OF US$1.5 million TO KBSC.	July 21, 1994			
DATE OF LAST TRANSACTION FOR FULL RECOVERY OF THE INITIAL DEPOSIT OF US$3.0 million TO NITI.	July 6, 1994			

Korea
Third Technology Advancement Project
Time Line of Cummulative Actual and Planned Disbursement Schedule



D. Project Implementation

Table 4: PLANNED AND ACTUAL COMPLETION DATES OF COMPONENTS/1

Project Components	Planned Completion Date	Actual Completion Date	Month of Delay (or Advance)	Percentage Differences (- for Advance)
Korea Institute of Science and Technology				
Civil Works	--	--	--	--
Equipment	December, 1993	June, 1994	6	19%
Technical Assistance	June, 1994	June, 1994	0	0%
Korea Basic Science Center				
Civil Works	December, 1991	N/A	N/A	N/A
Equipment	December, 1993	June, 1994	6	19%
National Industrial Technology Institute				
Civil Works	N/A	N/A	N/A	N/A
Equipment	December 31, 1993	June, 1994	6	19%

/1 Information about civil works for KBSC and NITI is not available. However, supervision missions found that construction was completed in time for the installment of equipment.

E. PROJECT COST AND FINANCING

Table 5: PROJECT COSTS (US$million)

Project Components	Appraisal Estimate			Actual Cost			Percentage Change of Total
	Local	Foreign	Total	Local	Foreign	Total	
Korea Institute of Science and Technology (KIST)	4.5	17.0	21.5	3.5	15.0	18.5	13.9
Korea Basic Science Center (KBSC)	7.5	17.9	25.4	n.a.a/	n.a.	n.a.	n.a.
National Industrial Technology Institute (NITI)	10.7	34.6	45.3	13.7	29.8	43.5	3.9
TOTAL	22.7	69.5	92.2	-	-	-	-

a/ Not available as KBSC did not submit information as requested.

Table 6: PROJECT FINANCING (US$million)

Source of Funds	Planned	Revised	Final	Percentage Change of Total
IBRD Expenditure Categories				
Equipment	60.0	58.5	58.5	- 2.5%
Training Assistance	-	1.5	1.2	-20.0%
Domestic Financing				
Korea Institute of Science and Technology (KIST)	6.7	-	3.5	-47.8%
Korea Basic Science Center (KBSC)	10.1	-	n.a. a/	n.a.
National Industrial Technology Institute (NITI)	15.4	-	13.7	-11.0%
TOTAL	92.2	-	-	-

a/ KBSC did not submit information as requested.

Table 7: ALLOCATION OF LOAN PROCEEDS (US$million)

	Original Allocation	Actual Disbursements
KIST		
(1.) Equipment, material and technical assistance for KIST under part A of the project.	15,000,000	15,021,306.99
KBSC		
(2.) Equipment and material for KBSC under part B of the project.	15,000,000	14,989,411.48
NITI		
(3.) Equipment and material for KBSC under part C of the project.	30,000,000	29,796,045.52
TOTAL	60,000,000	59,786,551.78

Amount of Loan Cancelled US$213,448.13.

F. PROJECT RESULTS

Table 8: DIRECT BENEFITS OF PROJECT

(a) KIST

Increase in the Annual Research Budget and Research Work

(Unit: Million Won (No. of Research projects))

Types of Projects	Start of project (1991)	End of project (Sept. 1994)
National	17,915 (148)	16,574 (87)
Industry Sponsored	3,236 (35)	4,496 (46)
In-house	772 (61)	5,862 (71)
Total	21,923 (224)	26,932 (204)

The 210 items of new equipment in KIST represent a key factor in improving the quality of research programs and have also contributed to the "KIST 2000" research program which is designed to increase future-oriented technological advances. Approximately 95 researchers benefited from overseas research. Beginning in 1991, a program of collaborative research and study was initiated and drew 250 students and researchers from major universities and research organizations.

(b) KBSC

KBSC acquired 69 pieces expensive research equipment with the help of both government support and the IBRD loan in order to provide common facilities and equipment for basic research. The newly equipped laboratories have enhanced significantly the quality of joint research programs and expanded joint research efforts by scientists from universities and the national research institutes. The number of joint research projects increased from 1,511 in 1991 to 2,481 in 1994 and the number of samples tested for outside users increased from 6,873 in 1991 to 15,720 in 1994.

(c) NIRI, now NITI

Four hundred and two items of equipment were procured and these are helping to strengthen NITI's capacity to develop and apply more rigorous industrial standards which would contribute to raising the quality of industrial products. NITI's annual research programs increased from 32 projects in 1990 to 121 in 1994 and technical assistance to SMIs increased from 662 enterprises in 1990 to 1309 in 1994.

Table 9: - G. STATUS OF LOAN COVENANTS

Section No.in Loan	Para No.in SAR	Description Agreement	Status of Compliance and Deadline Dates, if applicable
4.01	3.16	Furnish to Bank audit report including a separate opinion on Statement of Expenditures (SOEs).	By June 30 of each year. In full compliance.
5.01	3.09	Manage project with adequate qualified and experienced staff.	In full compliance.

Table 10: - H. USE OF BANK RESOURCES

Stage of Project Cycle	Planned			Final		
	HQ	Field	Total	HQ	Field	Total
Through Appraisal	N/A	N/A	20	7.3	3.8	11.1
Appraisal -Negotiations	N/A	N/A	10	3.4	4.0	7.4
Negotiations -Loan Signing	N/A	N/A	4	1.7	-	1.7
Supervision	N/A	N/A	18	5.0	3.9	8.9
PCR	N/A	N/A	7	1.1	-	1.1
Others (Project Admin.)	N/A	N/A	2	N/A	N/A	1.5
Total	N/A	N/A	61	N/A	N/A	31.7

Table 11: MISSION DATA BY STAGES OF PROJECT

Mission	Month/Year	No. of Person/1	Staff Week in Field		Performance Status by Activity/2				
					F	M	P	I	G
Identification	N/A	N/A	N/A						
Preparation (by Gov)	9-12/89	--	--						
Pre-appraisal	2-3/90	3(PE, TE, TS)	3.8						
Appraisal	6/90	3(PE, TE, TS)	4.0						
	Subtotal		7.8						
Supervision I	10-11/91	2(TE, ITS)	1.6		1	2	1	1	1
Supervision II	5-6/92	1(TE)	0.6		1	1	1	1	1
Supervision III	5/93	1(TE)	0.5		1	1	1	1	1
Supervision IV	10/93	1(TE)	0.5		2	1	1	1	1
Supervision V	4-5/94	1(TE)	0.7		1	1	1	1	1
	Subtotal		3.9	Avg	1.2	1.2	1.0	1.0	1.0
PCR	11/94	1(TE)	0.5						
	Total		11.7						

/1 PE = Principal Economist; TE = Technical Educator; TS = Technology Specialist
ITS = Industrial Training Specialist
/2 F = Financial; M = managerial; P = Procurement; I = Project Development Objectives
G = Overall Status

ANNEX 1

PROJECT COMPLETION REPORT

KOREA

THIRD TECHNOLOGY ADVANCEMENT PROJECT
(Loan 3315-KO)

PARTICIPANTS IN COMPLETION MISSION[1/]

World Bank

Sing-Zak Sung, Consultant, Technical Educator

Korea Institute of Science and Technology

Jung-Huah Cho, Chief, International Cooperation Division

Korea Basic Science Center

In-Ho Gim, Director, Planning and Management Department

National Industrial Technology Institute

Jong-Hee Hong, Chief, Thermal Engineering Division

1/ The completion mission was undertaken as part of the supervision mission for the Second Technology Advancement Project and supervision mission for two Health Technology Projects in April/May 1994.

ANNEX 2

PROJECT COMPLETION REPORT

KOREA

THIRD TECHNOLOGY ADVANCEMENT PROJECT
(Loan 3315-KO)

RECORD OF PROGRESS REPORTS SUBMITTED

1. Report on the KIST Project Implementation from Korea Institute of Science and Technology, December 1991.

2. Status Report of Project Implementation (IBRD Ln. 3315-KO) from Korea Institute of Science and Technology, May 23, 1991.

3. Status Report on the 3rd Technology Advancement Project: Implementation State of Equipment Procurement Plan from National Industrial Technology Institute, May 1992.

4. Status Report of KBSC to IBRD (Third Technology Advancement Project) from Korea Basic Science Center, May 1992.

5. Status Report of Project Implementation (IBRD 3315-KO, Part A) from Korea Institute of Science and Technology, November 10, 1992.

6. Progress Report of KBSC to IBRD (IBRD Loan 3315-KO) from Korea Basic Science Center, November 1992.

7. Status Report of Project Implementation (IBRD 3315-KO, Part A) from Korea Institute of Science and Technology, March 20, 1993.

8. Status Report of Project Implementation (IBRD 3315-KO, Part A) from Korea Institute of Science and Technology, May 15, 1993.

9. Progress Report on IBRD Loan Project 3315-KO from Korea Basic Science Center, May 1993.

10. Status Report on the 3rd Technology Advancement Project: Implementation State of Equipment Procurement Plan from National Industrial Technology Institute, May 1993.

11. Status Report of Loan Project Implementation (Loan No. IBRD 3315-KO, Part A) from Korea Institute of Science and Technology, September 30, 1993.

12. Progress Report on IBRD Loan Project 3315-KO from Korea Basic Science Center, October 1993.

13. Status Report on the 3rd Technology Advancement Project: Implementation of Equipment Procurement Plan from National Industrial Technology Institute, October 13, 1993.

14. Status Report of Loan Project Implementation (Loan No. IBRD 3315-KO, Part A) from Korea Institute of Science and Technology, April 30, 1993.

15. Progress Report on IBRD Loan Project 3315-KO from Korea Basic Science Center, May 1994.

16. Status Report on the 3rd Technology Advancement Project: Implementation of Equipment Procurement Plan from National Industrial Technology Institute, May 1, 1994.

IMAGING

Report No: 14752
Type: PCR